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ABSTRACT

The article describes a curriculum used in gifted programming which is based on Guilford's Structure of Intellect (SOI) theory of intelligence. Sourcebooks and individual SOI modules have been developed to train over 90 kinds of intellectual ability. Five categories of intellectual ability are defined (cognition, memory, evaluation, convergent production, and divergent production), and sample SOI activities are listed in each category for use by teachers and parents in facilitating intellectual development in gifted children. Appended is a complete list of the 18 discrete intellectual abilities which comprise each of the five SOI categories. (JW)

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A CURRICULUM FOR DEVELOPING INTELLIGENCE

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From an article published in
Gifted Children Monthly

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Right brain,
Left brain,
Split brain,
Whole brain.

It sounds like a child's song, doesn't it? But what is it all about? It is about intelligence, really, about the *functions*, or the products of the human brain—its hemispheres and sites. This renewed interest in the brain is a signal that a good educational program should be as much concerned with the development of intellectual abilities as with knowledge from subject matter.

WHAT IS INTELLIGENCE?

If intelligence is the end result of brain functions, what are these functions? Doesn't the brain dictate all thought and actions? Yes, of course it does. What has been needed for a long time is a theory of human intellectual products which corresponds with the functions of the brain. The best and most precise *theory* we have is the Structure of Intellect which is Guilford's theory and is derived from repeated measurements of 120 kinds of products.

There are fourteen major dimensions of intelligence in the Structure of Intellect (SOI), Guilford's theory of intelligence. If your child is in a gifted program which is *passive* , that is, it tends to be composed of accelerated subject matter (i.e., putting a third grade student into fifth grade materials, etc.), it is crucial that the goals of this kind of programming be reconsidered as perhaps too limiting for gifted students.

When students are placed into gifted programs because they have gifted intelligence, then the program should address the teaching and enhancing of their *intelligence*, beyond academics because academic aptitude is only one kind of function—Convergent Production.

If students are placed into gifted programs because they have talent—athletic, art, music, dance, creativity or because they indicate gifted leadership—then the program should address the enhancement of that giftedness beyond their academic achievement. Thus, programs and budgets for them should address the individual *gifted* needs as well as group academic progress.

Since 1962, we in California, under the leadership first of Joe Rice, then Paul Plowman, Jack Mosier and Eleanor McKinney (California State Department of Education), have been engaged in addressing these differential needs. And among the questions to be addressed by parents is this one: *Should gifted children be taught to think?* Shouldn't we develop or enhance their minds? (See *Developing Minds: A Resource Book for Teaching Thinking,* edited by Arthur Costa, published by the Association for Supervision and Curriculum Development, Alexandria, Virginia.)

Gifted programs which are defined by a narrow band of interests on the part of educators or on an opinionated philosophy define giftedness too narrowly. Such programs become passive and not only lead to narrowness, but *limit the development of human intelligence in its broadest range.*

We learn daily how masterful the brain is, how both internal and external environments determine neural pathways. Giftedness when thought to be a curricular phenomenon is passive because it is the old way; it is easy and familiar, but it is passive. Knowledge alone will not serve students for tomorrow's needs; knowledge is a necessity but is not sufficient. Computers, great books, encyclopedias and calculators can store this knowledge, and those gifted students who are graduates of passive

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gifted programs are likely to exit their education with knowledge but not with brilliant reasoning or problem solving abilities. We should want our gifted students to approach life shining with the excitement of learning and discovery, open minded and mentally free to use their wonderful minds in new ways which both build upon and depart freely from the known.

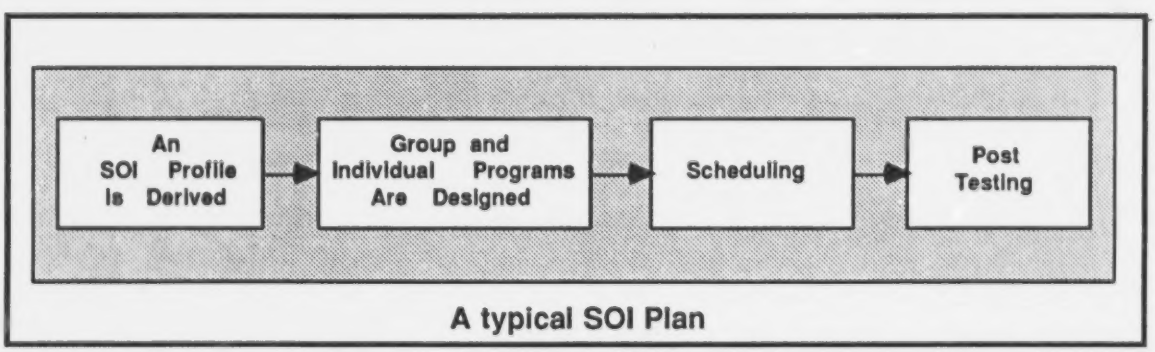
The SOI rationale offers more than a secure base from which to expand gifted programming. It has 23 years (1962 to the present) of validity and reliability research studies behind it (see ERIC documents numbered EC 11-0-2-882). More, SOI tests allow educators to assess students' entry intellectual abilities, how they are translated to improved achievement and how effectively the curriculum has impacted on and improved their giftedness by offering a post test for measuring exit intellectual abilities.

One hundred twenty (120) kinds of intellectual abilities form the SOI. Much like the chart of elements, not all were identified during the 15 year investigation by Guilford and his associates (1944-1959). Of these, we have found 26 to be highly predictive of success in school learning. These are tested on the SOI-Learning Abilities Test. Some are involved in language arts curriculum; other abilities are necessary for arithmetic and math and still others for differing kinds of creativity.

OPERATIONS		CONTENTS		PRODUCTS	
C	Cognition	F	Figural	U	Units
M	Memory			C	Classes
E	Evaluation	S	Symbolic	R	Relations
N	Convergent Production			S	Systems
D	Divergent Production	M	Semantic	T	Transformations
				I	Implications
Thinking		Type of Contents Used		Resulting Products	

SOI Model showing the 14 dimensions

Figure 1



A typical SOI Plan

Figure 2

If you do not have access to your child's SOI profile, you can still use a general non-specific-at-home program. There are nine sourcebooks and individual SOI modules to train over ninety kinds of intellectual abilities. The sourcebooks offer lesson plans and exciting activities which cover a wide range of disciplines. They do however require some effort to pull together all the many diverse materials needed. The training modules are more game-like books which allow children to work independently and at their own pace.

How can parents and teachers facilitate the development of SOI programming? Here are some specific self-help activities which will augment any good gifted program.

COGNITION (*or comprehension. There are 18 specific kinds of cognition; nine are tested on the SOI-LA Test.*)

The SOI Cognition Sourcebooks have exact exercises as well as general activities to use. The child who is high in comprehension catches on easily, is alert and curious about the environment. The child who is low in cognition needs prompting, repetitive trials, may take in things better through his ears or hands than his eyes. Cognition is the beginning of all future learning. Gifted children can be high or low in cognition! You need to know diagnostically.

Cognition Tasks Teachers or Parents Can Use (vary these with vocal, visual and kinesthetic input where possible)

1. Teach children to identify objects by name (CFU);
2. Provide pictures, words and numbers to be classified (CFC, CSC, CMS);
3. Find items which are related to each other; let the child find the relationships (CFR);
4. Provide figures which may be transferred into other shapes; increase this difficulty as children mature. Montessori materials perform this training as well as do the martial arts and sports which not only require the use of but also help to integrate both sides of the body (CFT);
5. Provide complex relationships, patterns or systems in material to be decoded (CFS, CSS);
6. Increase instructions from one or two at a time to more complex ones (CMS);
7. Teach and ask for several other meanings to any word or expression (CMT);
8. Ask the child to anticipate the needs of consequences of a given situation (CMI);
9. Provide regularly new and unusual words to be learned (CMU).

MEMORY (*There are 18 specific kinds of memory; five are tested on the SOI-LA Test.*)

Nearly all gifted children enter school with such exceptional memory abilities that they rarely need memory training, but if they do have memory difficulty then concentrate on SOI memory modules. Many children are identified as learning disabled when they may actually be gifted but they cannot perform for lack of specific memory skills.

Memory Task Teachers and Parents Can Use (vary vocal, visual and kinesthetic input where possible)

1. Have children recall material learned by visual, tactile or auditory presentation (MFU, MMU, MSU);
2. Have children recall arrangement of objects previously shown and removed (MFU);
3. Have children recall for immediate production, after one-or-two-second presentations, a series of numerals or letters (MFU);
4. Drill each type of mathematics operation, no more than 10 minutes at a sitting; gifted children who show patterns of learning disabilities and dyslexia cannot sequence in general and will fail on most systems tasks (MSS);
5. Read a paragraph aloud and have children recall as many of the ideas as possible (MMS);
6. Have children make up problems for others to solve and let them grade their answers (MSS, MSI, MMS, MMR, MMI);
7. Give children a page of reading words in scattered order to study, then have them tell how many there were and what they were (MMU);
8. Present related pairs of words on a page to recall after study (MMU, MMS);
9. Have children remember the order of events and anticipate what could happen (MMR, MMS);
10. Provide music and foreign language training as early as possible.

EVALUATION (judging, planning, decision making, analysis and logic; there are 18 kinds of evaluation abilities, four are tested on the SOI-LA Test)

Because research indicates that gifted children do not typically show Evaluation giftedness, it is important to have diagnostic test results on them. Life demands foresight, planning and the taking of responsibility. They need many opportunities to make decisions, to lead committees and to learn how to make good judgments. When too much of the school day is spent learning knowledge and "working for a grade," gifted learners have less chance to develop Evaluation abilities. They are afraid to risk making mistakes; this over develops convergent thinking at the expense of evaluation and creative thinking. One reason many of them score less well on college entry tests is that when they do not trust their reasoning they are afraid to use it.

Evaluation Tasks Teachers and Parents Can Use

1. Have children make judgments about how materials can be sorted and classified (EFC);
2. Give children codes to decipher and crossword, logic, math or crosstic puzzles to solve (EFR, ESR, ESS);
3. Present problems (spatial, numerical or semantic) for finding defects or absurdities in them and let children suggest improvements (EMT);
4. Give children numerical series in which to find related numbers (ESR, ESS);
5. Have children select several words which may be used in place of each other to get the same or different meanings (EMT);

6. Have them practice their logic in testing correctness of conclusions (EFI, ESI, EMI);
7. Have children appraise aspects of common situations in terms of experience (EMR);
8. Give children practical judgments about ideas that are presented; Innovative Science and the Matthew Lipman's Philosophy for Children program is excellent for training verbal/semantic evaluation as are forensics programs (EMS).

CONVERGENT PRODUCTION (problem solving where answers are known; there are 18 different kinds, four are tested on the SOI-LA Test)

The school achievement abilities describe problems solving where there are correct solutions, unchanged from the way it was taught. High conforming students do well here; they are superior students who reproduce what is wanted. However, their giftedness may be limited to scholastic achievement. These children write neatly, spell well, and generally do what is expected of them in a passive learning environment. They need the enrichment of Divergent Production and Evaluation tasks to become more flexible and capable of meeting unexpected situations. On the other hand, gifted students who are poor performers need to be taught how to reproduce exactness. Teachers have excellent methodologies for teaching Convergent Production.

Convergent Production Tasks Teachers and Parents Can Use

1. Give children figures to reproduce and exercises to mimic (NFU);
2. Give children major catagories into which to sort pictures, words, or numerals. Golden Science Books and coin, minerals, gems and stamping collecting as hobbies are useful (NFC, NSC, NMC);
3. Give children deduction problems (NMR);
4. Give children blank spaces in sentences or numerical series to fill in (NMU);
5. Have children solve simple equations orally (NSU, NSI, MSI);
6. Have children state the order of symbolic systems from start to goal correctly (NSI);
7. Give children concepts or ideas for which they must give the correct name (NMI);
8. Have children show relations between ideas (NMR);
9. Let children work on a computer to learn programming and to do their school work;
10. Provide jigsaw and crossword puzzles (NFR and NST).

DIVERGENT PRODUCTION (creative problem solving; there are 18 discrete kinds, three are tested on the SOI-LA Test)

This major ability is rarely included as a part of school curriculum. It is often difficult for teachers to depart from Convergent problem solving to creative problem solving. People who score high here are usually flexible, filled with new ideas, roll with changes in plans, good at unusual ways to solve problems, are self-confident and less anxiety prone; they often get bored with too much convergent production. Their zany

sense of humor often gets them into trouble. The child who has not been able to experience the freedom of Divergent Production can become anxious, not self-confident and unable to be flexible. As educators learn more about the importance of a theory for curriculum they begin to include a modicum of creative training and experience. It is important for students to learn rules and structure which allow two-dimensional creative thought as well as unstructured, open-ended, hands-on experiences.

Divergent Production Tasks Teachers and Parents Can Use

1. Have children reclassify objects, pictures, numbers and words in unusual ways (DFU, DSU, DMU);
2. Have children generate a variety of relations between numbers, letters or ideas (DMU, DSU, DFU);
3. Give children opportunities to brainstorm ideas and do much creative writing by hand or on a word processor (DMU);
4. Have children produce words from given synonyms or associated words (DMR);
5. Have children produce clever titles, uncommon ways of using common objects (DMI);
6. Allow brain storming without making value judgments about the result and build one solution with alterations to another solution (DMS, DMT, DMI);
7. Let them video tape their own stories acted out by their friends or classmates (DMT, DMI).
8. Provide drama, art, dance and other hands-on experiences.

SUMMARY

Forty years of research and 23 years of validation and reliability studies can hardly be touched upon in this paper. Far more important, however, is the necessity for parents and educators to understand and use the SOI model for developing the 90 discrete kinds of intellectual abilities. Just as we want our bodies well developed, so must we further develop our children's minds completely for their future successes.

When Nature her great master piece designed,
And framed her last, best work, the human mind,
Her eye intent on all the wondrous plan,
She formed of various stuff the various Man.

Robert Burns

UNDERSTANDING SOI DEFINITIONS

COGNITION-Comprehension

CFU	Ability to identify objects, visually and auditorially
CFC	Ability to classify perceived objects
CFR	Ability to discover relations in perceptual material
CFS	Ability to perceive spatial patterns and maintain orientation (for math)
CFT	Ability to understand transformed objects visually (for math)
CFI	Ability to explore visually ways to select most effective action
CSU	Ability to recognize graphic symbols: codes, numbers, notes
CSC	Ability to identify attributes of patterns
CSR	Ability to discover abstract relations in symbolic patterns
CSS	Ability to understand systems involving symbols (arithmetic facts)
CST	Ability to recognize that a specific transformation of symbolic information has occurred
CSI	Ability to foresee or be sensitive to conquences in a symbolic problem
CMU	Ability to use vocabulary
CMC	Ability to comprehend concepts and classes of ideas and words
CMR	Ability to discover relations between concepts
CMS	Ability to comprehend systems of words and ideas (reading, instructions)
CMT	Ability to see several meanings in words or ideas
CMI	Ability to anticipate needs or consequences

MEMORY

MFU	Ability to recall visual and auditory stimuli
MFC	Ability to remember previously presented classes of figural material: visual, auditory or kinesthetic
MFR	Ability to memorize relations between items of figural information presented
MFS	Ability to recall arrangements of objects previously presented
MFT	Ability to remember transformations of figural material previously changed
MFI	Ability to remember circumstantial connections between or among items of figural information as a basis for logical or causal extrapolation
MSU	Ability to recall for immediate production a group of numerals or letters
MSC	Ability to remember symbolic class properties
MSR	Ability to remember definitive connections between units of symbolic information
MSS	Ability to remember systems of numerals, letters in exact order (spelling)
MST	Ability to remember changes in symbolic information
MSI	Ability to remember symbols and their implications
MMU	Ability to reproduce previously presented ideas or words
MMC	Ability to remember verbal or ideational class properties
MMR	Ability to remember meaningful connections between items of verbal information
MMS	Ability to remember a system of ideas presented visually or auditorially
MMT	Ability to remember changes in meanings or redefinitions
MMI	Ability to remember arbitrary connections between pairs of meaningful ideas

EVALUATION-Judgement, planning, reasoninf and critical decision making

EFU	Ability to identify similarities and differences of shapes
EFC	Ability to develop the ability to judge whether figures are properly classified
EFR	Ability to evaluate spatial relationships
EFS	Ability to evaluate total systems of spatial information
EFT	Ability to judge or analyze how figures or objects will appear after changes
EFI	Ability to predict and evaluate defects and deficiencies in spatial information
ESU	Ability to make rapid decisions identifying letter or number sets
ESC	Ability to judge the applicability of class properties of symbolic information
ESR	Ability to determine the consistency of symbolic relations
ESS	Ability to estimate the appropriateness of aspects of a symbolic system
EST	Ability to judge adequacy of substitutive symbols
ESI	Ability to judge consistency of, inferences from symbolic information
EMU	Ability to select appropriate variations in word meanings
EMC	Ability to judge applicability of class properties of semantic information
EMR	Ability to make choices among semantic relationships based on the similarity and consistency of meanings (analogies)
EMS	Ability to appraise aspects of systems of words
EMT	Ability to apply changes in judgement about ideas
EMI	Ability to judge the adequacy of a meaningful deduction (deductive reasoning)

CONVERGENT PRODUCTION-Solving problems where answers are known

NFU	Ability to reproduce exact information in spatial forms (writing, copying)
NFC	Ability to sort or classify as pre-specified
NFR	Ability to reproduce figural relationships
NFS	Ability to reproduce a known system or design
NFT	Ability to change figural information into new forms
NFI	Ability to solve simple equations in terms of familiar forms from inferred data
NSU	Ability to reproduce patterns of single, simple symbols (coding)
NSC	Ability to classify items of symbolic information in pre-specified ways (filing)
NSR	Ability to find nonverbal responses in relationships between numerals or letters
NSS	Ability to solve correctly a problem using symbolic systems
NST	Ability to reproduce new symbolic items of information by revising given items
NSI	Ability to substitute or derive symbols as expected (logic and algebra)
NMU	Ability to correctly name semantic concepts and ideas
NMC	Ability to classify correctly words or ideas
NMR	Ability to correlate verbal representations (analogies)
NMS	Ability to arrange ideas into a meaningful sequence (essay writing)
NMT	Ability to shift functions of ideas for use in new ways
NMI	Ability to infer correctly from given, known information

DIVERGENT PRODUCTION-Solving problems creatively

DFU	Ability to produce many and unique varieties of figures within structure (art)
DFC	Ability to reclassify perceived objects in unique ways
DFR	Ability to generate new and constructive relations between figural items
DFS	Ability to produce composites of figural information in new systems
DFT	Ability to devise figural information
DFI	Ability to elaborate on figural information in unexpected forms
DSU	Ability to produce many symbolic units which conform to simple specifications
DSC	Ability to group items of symbolic information in different ways
DSR	Ability to generate a variety of relations between numbers or letters
DSS	Ability to produce symbolic systems in unique ways
DST	Ability to transform symbolic material
DSI	Ability to produce varied implications from given symbolic information
DMU	Ability to create many ideas spontaneously (brain-storming)
DMC	Ability to produce new ideas appropriate in meaning to given categories
DMR	Ability to produce unique ideas from associated words (poetry)
DMS	Ability to originate unique verbal ideas (creative writing)
DMT	Ability to produce remotely associated, clever, or uncommon verbal responses (puns)
DMI	Ability to specify details that develop a scheme or variation of an idea (joke, humor)

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